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Self Image and Environmental Attitude and Behavior

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Abstract

In this paper, we examine some important aspects related to safeguarding environmental quality. Beginning by defining the identity of the agents considered, we conceptually describe how while they have different identities, they can be simultaneously influenced by three distinct elements: self image and environmental attitude and behavior. We define self image as the individual's willingness to cooperate for the sake of the public good, we define environmental attitude as the individual's concern regarding waste prevention and disposal, and the environmental behavior as the individual's recycling behavior. Using the 1998 wave of the Multipurpose Household Survey (MHS), which is conducted annually by the Italian Central Statistical Office, and univariate probit models, we show that there is a positive relationship among these factors that is robust to the inclusion of social participation variables and to the use of a sub-sample of individuals who have no interest in environmental issues.

Keywords— Self Image, Waste Concern, Recycling Behavior, Pro-Social Behaviors, Italy

1 Introduction

The economic literature increasingly recognizes that individuals are not solely concerned with monetary rewards/punishments but also with non-monetary aspects, such as the various behavioral norms (warm-glow, altruism, social, personal) that may be used to induce desirable actions (Meier 2006; Van Den Berg 2008; Abbot et al. 2013; Alpizar and Gsottbauer 2015). People's attitudes and behaviors toward environmental protection have become a fertile area in which to examine the importance of non-monetary incentives. Several studies in the economic literature have considered the role of pro-social behaviors, i.e. warm-glow, social norms, self

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image and social capital, in pro-environmental attitudes and behavior. For example, Halvorsen (2008), Hage et al.(2009) and Abbot et al.(2013) show that moral and social norms influence pro-environmental behaviors, while Brekke et al. (2003, 2010) and Czajkoswi et al. (2015) find that self image is central to recycling behavior. Finally, Owen and Videras (2006, 2007) and Videras et al.(2012) show that individuals who are more willing to behave according to civic and cultural norms and have more social ties are also more willing to protect a public good, namely, the natural environment. The aim of this paper is to improve our general knowledge concerning the importance of non-monetary motives in environmental quality by investigating the role of the identity, self image and environmental attitudes and behavior. The paper contributes to the literature by: a) incorporating self image and environmental attitudes and behavior into a microeconomic framework; b) estimating the relationship among self image, environmental concern and recycling behavior using Italian data; and c) controlling for the robustness of the results by considering additional pro-social behaviors, such as social participation, and a sub-sample of individuals who are not concerned with environmental issues. Environmental concern and behavior, among many other elements, are affected by a person's sense of self. This perception of the self radically influences economic outcomes, we can define a person's sense of self as the identity of an agent (Akerlof and Kranton 2000). When we consider the concept of identity in the context of pro-environmental attitudes and behavior, it is useful to emphasize that the choice of an identity is fundamental to determining what people choose to do or what types of economic decisions that people make. Thus, identity influences people's preferences and the behavior; in addition, identity can also have a strong impact on an agent's behavior in the context of strategic interaction. As a consequence, everyone bases his or her actions on payoffs related to his or her specific identity. If we consider different identities, it is also necessary to define different social groups that follow a set of corresponding normative prescriptions for behavior, as that each member of the group will decide to behave differently any given situation. For this reason, it is useful to build a social identity model that considers a mechanism able to theoretically and empirically investigate the role of ecological identity based on pro-environmental attitudes and behavior. This approach can help to characterize how behavior can change from one situation to another or from an agent with a specific identity to an agent with a different identity. Hence, our theoretical framework employs a concept of identity formalized in an economic analysis by Akerlof and Kranton (2000, 2005). They consider a utility function for each agent of a population with an element-defined identity. This variable depends on social categories, the appropriate behavior for people belonging to different categories, the action of each agent in the population and the characteristics of an individual agent. Beginning from this theoretical perspective, we

understand the role that self image plays in influencing pro-environmental attitudes and the decision to adopt pro-environmental behaviors and the relative value that is attached to these preferences and actions. In the theoretical framework, we extend the existing literature in two regards. First, to the best of our knowledge, we are the first to make a plausible connection between a utility function incorporating the notion of identity described by Akerlof and Kranton (2000, 2005) and the model of moral motivation and social incentives applied by Brekke et al.(2003,2010) and Czajkoswi et al.(2015). Second, in contrast to Brekke et al.(2003,2010), we do not focus our attention on the influence of individual identical agents on the social welfare function but identify two categories of agents with different levels of optimal ideals and moral effort to study their behavior separately. In addition, unlike Czajkoswi et al. (2015), we consider two different utility functions, one for each category of agents, with the aim of highlighting the heterogeneity and different behaviors of the agents. Furthermore, we also include two additional components in the utility function considered by Czajkoswi et al.(2015), namely, the attitude toward devoting effort to safeguard the environment and recycling activity. In the empirical analysis, we use a dataset of approximately 36,000 individuals from the Multipurpose Household Survey (MHS) conducted annually by the Italian Central Statistical Office (ISTAT). We consider the year 1998 for a crucial and fundamental reason: at that time, there was no promotional campaign in place to make the population aware of the importance of environmental matters. Thus, individual awareness of and behaviors related to environmental problems were influenced exclusively by their own way of being. Among the main environmental problems, we consider waste prevention and disposal, as the European Commission had published several waste-related directives intended to reduce waste generation and increase waste recycling (Nicolli and Mazzanti 2011; Cecere et al. 2014). We measure environmental attitudes using a dummy variable that equals one if the respondent claims that “waste prevention and disposal ”is “the most worrying environmental problem”. We denote this variable *WasteConcern*. Moreover, to measure an individual’s willingness to incur a cost to protect the environment, we use an environmental behavior variable denoted *RecyclingBehavior*. The latter is a binary variable equal to one if the individual recycles at least one of four different materials: paper, glass, plastic and aluminum. The key independent variable is *SelfImage*, which is measured on a scale from 0 to 3, with 3 being associated with the highest level of civic cooperation that limits free-riding behavior. Using univariate probit models, we show that self image is related to an individual’s concern regarding waste prevention and disposal (*WasteConcern*) and to an individual’s decision to recycle (*RecyclingBehavior*). These findings are robust to the inclusion of more pro-social behaviors, such as social participation variables, which might be correlated with self

image, and to restricting the analysis to a sub-sample of individuals who are not concerned with environmental issues, following the theoretical framework. To the best of our knowledge, an empirical assessment of the relationship among self image, waste concern and recycling behavior has never been performed for the Mediterranean countries. The paper is organized as follows. Section 2 offers a brief review of the related literature, while Section 3 presents the theoretical model. Section 4 describes the data and presents the empirical strategy. Section 5 illustrates the results, while the final section concludes.

2 The Literature

The literature has investigated the importance of psychological factors in pro-environmental behavior in general and in waste recycling in particular. Several studies consider beliefs, values, social influences, and social and personal norms¹ (Thomas and Sharp 2013). Vining and Ebreo (1990), using data from Champaign and Urbana in Illinois (USA), show that among the factors that distinguish recyclers from non-recyclers are knowledge and intrinsic motives, such as altruism and environmental concerns. Using experimental data, Hopper and McCarl Nielsen (1991) find that recycling behavior is influenced by social and personal norms. Hornik et al. (1995), Schultz et al. (1995), and Thøgersen (1996), in reviews of prior empirical psychological studies on recycling behavior, show that the important predictors are social influence (of friends, family members and neighbors) and knowledge of, attitudes toward and commitment to recycling. More recent studies confirm the importance of knowledge, attitudes and personal norms in waste recycling (Ebreo and Vining 2000; Chu and Chiu 2002; Barr 2007; Sidique et al. 2010). Other contributions from the economics literature have focused on warm-glow and social norms and the joint impact of the two.² Bruvoll et al. (2002), using Norwegian data, show that sorting activities by households are based on many different motives, including social or moral obligations. In a study of recycling behavior in a Swedish municipality, Berglund (2006)

¹Social norms are rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of law. The violation of social norms is met with sanctions. Social norms may become internalized, in which case sanctions (in the form of feelings of guilt or pride) are administered by the individual upon him or herself. Internalized norms are called personal (moral) norms (Biel and Thøgersen 2007, 94).

²The reference points for warm-glow are Deci (1971) in the psychological literature and Andreoni (1990) from economics literature. According to Deci (1971, 105), warm-glow means that an individual is motivated to perform an activity when he/she receives no apparent reward except the activity itself. In the model of Andreoni (1990), warm-glow means that the individual “s utility is not just a function of the consumption of the private and public goods but also of the individual’s contribution to the public good itself. This is commonly referred to as the “warm-glow” effect and describes a form of impure altruism (Daube and Ulph 2016).

shows that people who take a strong positive moral stance toward waste sorting are more likely to express relatively low opportunity costs of the time devoted to these activities and respond negatively to the introduction of economic incentives in waste management. Kinnaman (2006), in summarizing results on residential recycling in United States, suggests that the benefits of recycling accrue primarily as warm-glow utility gained by recycling households, to the extent that households may even be willing to pay for the opportunity to recycle. In investigating individual behavior regarding waste reduction using large EU surveys, Cecere et al. (2014) find that individual behavior regarding waste reduction is driven primarily by altruistic motives, which are not necessarily associated with either economic incentives or social norm pressure. Hage et al. (2009) analyze the determinants of recycling efforts in Swedish households, focusing on the case of packaging waste (i.e., paper, glass, plastic and metal). They develop a theoretical framework that integrates norm-motivated behavior into a simple economic model of household choice. The results indicate that a moral motive (“I recognize a moral obligation to recycle”) explains household recycling rates, while a social norm (“Important persons close to me want me to recycle”) is not statistically significant. Halvorsen (2008) models how warm-glow and moral and social norms and the opportunity cost of time affect household recycling efforts. He uses data from Norway on six recycling activities, finding that indicators of warm-glow and moral and social norms increase household recycling activities. Abbot et al. (2013), using English local government data, show that social norms affect recycling but do not find a significant relationship between warm-glow and recycling. Warm-glow can also be interpreted as self image gains from contributing to the public good. Various other authors have developed more sophisticated models based on the premise that individuals derive intrinsic value from self image motive (Daube and Ulph 2016). Nyborg et al. (2006) construct a model in which individuals are motivated by a concern for self image, which depends on the total benefit a “green ” good yields to the population and by the perception of what share of the population is choosing to consume the “green ” option. Hence, the individuals’ intrinsic incentive to be pro-social increases as the share of the population acting in that way increases. Brekke et al. (2003) identify warm-glow with a positive self image, a relationship that depends on the degree to which individuals believe that their behavior is socially responsible. The individual’s self image of being socially responsible is determined by a comparison of that individual’s actual behavior with an endogenously determined morally ideal behavior. The morally ideal contribution was defined as the contribution that would have maximized social welfare had it been provided by all. Brekke et al. (2010) consider the role of what they refer to as duty orientation. A duty-oriented individual prefers a self image of being a socially responsible person. Duty orientation can be regarded

as an extension of the standard impure altruism model (Andreoni 1990): like the impure altruist, a the duty-oriented individual receives a warm-glow, which increases with the size of his or her contribution; however, unlike the impure altruist, the warm-glow decreases in perceived responsibility, and there is also a so-called cold shiver from not giving enough. If the level of perceived responsibility is held fixed, duty orientation is behaviorally indistinguishable from a warm-glow model. Using data from Statistics Norway, empirical results show that duty orientation is central to recycling behavior, responsibility ascription is influenced by the perception of what others are doing, and people are reluctant to accept responsibility based on uncertain information, indicating that responsibility is a burden. Czajkowski et al. (2014), in investigating the determinants of individuals' stated preferences for household recycling, construct a model in which economic factors, personal moral sentiments and social pressure can all contribute to an individual's decision on how much to recycle. Using Polish data, the main result is that the willingness to pay for higher levels of household recycling is primarily linked to a moral motivation, associated with the belief that sorting at home is more thorough than sorting at a central facility. Social capital has also been emphasized as a significant factor influencing pro-environmental attitudes and behavior (Pretty and Ward 2001; Pretty 2003). Using data on Scotland, Collins et al.(2006) show that social capital, measured by charitable work, is positively associated with waste recycling. Torgler and García-Valinas (2007) empirically investigate the determinants of an individual's attitudes toward preventing environmental damage in Spain, showing that social capital, such as trust and membership in voluntary environmental organizations, has a strong impact on an individual's preferences to prevent environmental damage. Using data on Taiwan, Tsai (2008) estimates the impact of social capital on the regional recycling rate. He provides evidence that regional social capital - measured by the number of volunteers in associations and the number of social organizations - is highly correlated with a region's recycling rate. Owen and Videras (2006), using data from the World Values Survey, find that individuals who are more willing to behave according to civic norms are also more willing to protect the public good of the natural environment. Owen and Videras (2007) and Videras et al. (2012) using OECD and US datasets, respectively, extend the results of Owen and Videras (2006) to church groups (and churchgoing) and social ties. Finally, using Italian data, Fiorillo (2013) reports that membership in non-profit associations and church attendance are correlated with recycling behavior. Crociata et al. (2015) extend the association to cultural participation, while Agovino et al. (2016) also include environmental associations and voluntary activities.

3 Theoretical Framework

The theoretical analysis is related to the relationship among self image and pro-environmental attitudes and behavior. In essence, we investigate how individuals perceive themselves and how individuals relate to other people influencing their attitudes, beliefs and values. Obviously, these aspects have implications for how people perceive pro-environmental behaviors and decide to adopt them. We use a concept of identity formalized in an economic analysis by Akerlof and Kranton (2000, 2005). They consider a utility function for each agent in a population with an element representing identity and other elements representing actions linked to identity. The identity variable depends on social categories, the appropriate behavior for people belonging to the different categories, the actions of each agent in the population and the characteristics of an individual agent. Starting from this theoretical perspective, we can begin to understand the role that Identity plays in influencing the decision to adopt pro-environmental attitudes and behavior and the relative value that is attached to these actions. However, in this conceptual framework, we do not consider the interaction among heterogeneous agents, as in Akerlof and Kranton (2000), but simply recognize two large categories, one that includes agents with pro-environmental behaviors and another with anti-environmental behaviors. Following Czajkowski et al. (2015), we develop a utility function that represents the individual level of satisfaction, which is influenced by certain aspects related to environmental quality. The different types of agents care about private consumption c , the level of environmental quality G , which is derived from a significant degree of recycling activity in the society, own self image S , meaning the image that each person wishes to present to the other members of society, the extent to which they consider it important to respect the environment R , and how much waste they recycle W . Thus, our model considers two categories of agents: P , which consists of agents with pro-environmental behaviors, and A , which includes agents exhibiting anti-environmental behavior. Considering the representative agents P and A , we seek to describe how they behave regarding improvements in environmental quality. We have the following utility functions:

$$U_P = I - p(g_{PS} + g_{PR} + g_{PW}) + (G) + S + R + W \quad (3.1)$$

$$U_A = I - p(g_{AS} + g_{AR} + g_{AW}) + (G) + S + R + W \quad (3.2)$$

Each equation includes an expression for total effort,

$$g_P = g_{PS} + g_{PR} + g_{PW}$$

and

$$g_A = g_{AS} + g_{AR} + g_{AW}$$

, which represents the sum of the efforts of representative agents P and A , respectively. Let us define g_{PS} and g_{AS} as the efforts agent P and agent A devoted to reach their respective targets for self image S . To represent self image, we introduce the variables g_{PS}^* and g_{AS}^* that denote the moral ideal contribution for each of two categories delineated above (Brekke et al. 2003, 2010, Nyborg 2011). Thus, we can write the expression for self image as

$$S_P = -s(g_{PS} - g_{PS}^*)^2$$

for agent P and

$$S_A = -s(g_{AS} - g_{AS}^*)^2$$

for agent A .

To formalize the effort level of those agents that consider environmental protection a priority, we introduce the variable R , which is defined in the following expressions as

$$R_P = -r(g_{PR} - g_{PR}^*)^2$$

for agent P and

$$R_A = -r(g_{AR} - g_{AR}^*)^2$$

for agent A . The variable R represents the extent to which environmental sensitivity influences the effort of the agents devote to protect nature; here, again, we include the variables g_{PR}^* and g_{AR}^* , which represent the exogenous, ideal optimal effort level devoted by each agent with different degrees of awareness with respect to ecological issues. Finally, we define the level of effort for the different categories of agents that effectively carry out the recycling activity W . In this case, we consider the optimal effort devoted to recycling activity for each of the categories g_{PW}^* and g_{AW}^* , and we compare this level with the effort performed by the agents. We describe this aspect using the following expressions:

$$W_P = -w(g_{PW} - g_{PW}^*)^2$$

for agent P and

$$W_A = -w(g_{AW} - g_{AW}^*)^2$$

for agent A . The parameters s, r, w are weakly positive constant. To stress the difference between the pro-environmental agents and the anti-environmental agents, we establish the following tree conditions:

- $ag_{PS}^* > g_{AS}^*$

- $bg_{PR}^* > g_{AR}^*$
- $cg_{PW}^* > g_{AW}^*$

Clearly, the ideal level of effort is greater for those agents with a pro-environmental identity.

Having stated these expressions and conditions, we can rewrite equations 3.1 and 3.2:

$$U_P = I - p(g_{PS} + g_{PR} + g_{PW}) + (g_P + g_A) - s(g_{PS} - g_{PS}^*)^2 - r(g_{PR} - g_{PR}^*)^2 - w(g_{PW} - g_{PW}^*)^2 \quad (3.3)$$

$$U_A = I - p(g_{AS} + g_{AR} + g_{AW}) + (g_P + g_A) - s(g_{AS} - g_{AS}^*)^2 - r(g_{AR} - g_{AR}^*)^2 - w(g_{AW} - g_{AW}^*)^2 \quad (3.4)$$

The two types of agents P and A maximize equations 3.3 and 3.4, respectively, and the optimal total effort for each agent is as follows:

$$\hat{g}_P = \left(\frac{p-1}{2s} + \frac{p-1}{2r} + \frac{p-1}{2w} \right) + g_{PS}^* + g_{PR}^* + g_{PW}^*$$

$$\hat{g}_A = \left(\frac{p-1}{2s} + \frac{p-1}{2r} + \frac{p-1}{2w} \right) + g_{AS}^* + g_{AR}^* + g_{AW}^*$$

These two values correspond to the effort that maximizes the utility of each agent belonging to the two categories. Specifically, we note that each optimal effort level depends on the ideal level of effort for each category. From the three conditions stated above, we know that it is possible to affirm that

$$\hat{g}_P > \hat{g}_A$$

, and hence, the optimal effort devoted by pro-environmental agents is greater than that of anti-environmental agents because the two agent types have different ideal effort levels. Thus, the agents belonging to the two categories maximize their utility related to the own Identity following an ideal level of self image, an ideal target for recycling activity and their ideal sensitivity toward environmental problems. All of these components are linked additively, and as a consequence, the agents move their efforts toward their respective ideal level of effort. Even if differ in other respects they tend to maximize their identity utility function by considering the ideal level of effort and do not deviate from the values of $g_{PS}^*, g_{PR}^*, g_{PW}^*$ for agents exhibiting pro-environmental behavior and $g_{AS}^*, g_{AR}^*, g_{AW}^*$ for agents exhibiting anti-environmental behavior. Each category of agents rationally decides to reach the optimal values to maximize U_P and U_A . The two representative agents simultaneously devote greater effort, and thus, all of these decision variables move in the same direction; there is no incentive to partially increase one or two types of effort given the ideal level of effort that they wish to reach.

4 Empirical hypotheses, data and strategy

From a theoretical perspective, we have emphasized the relationship among three decision variables, $g_{PS}^*, g_{PR}^*, g_{PW}^*$ for the behavior of pro-environmental agents and $g_{AS}^*, g_{AR}^*, g_{AW}^*$ for the behavior of anti-environmental agents. This type of link is characterized by an ideal optimal value that each agent seeks to reach. At the end of the maximization process, it is clear that all of these variables move in the same direction. In other words, the agents simultaneously have an incentive to increase all effort to maximize the utility function. We expect that a positive relationship among these variables in the empirical investigation. In particular, we believe that there would be a positive link between self image and the level of sensitivity toward environmental problems and between self image and recycling activity. Hence, our empirical hypotheses are as follows:

- The measure of self image is positively correlated with the measure of environmental attitude (*Waste Concern*);
- the measure of self image is positively correlated with the measure of environmental behavior (*Recycling Behavior*).

The empirical analysis uses the 1998 wave of the Multipurpose Household Survey (MHS) conducted annually by the Italian Central Statistical Office. This large dataset is one of the best available for studying pro-environmental attitudes and behavior in a cross-sectional framework, as it investigates a wide range of behaviors through face-to-face interviews using a sample of approximately 20,000 households, roughly corresponding to 60,000 individuals. The 1998 wave is an invaluable dataset because there is a section on environmental issues not available in the other waves. The unit of analysis is the individual. The final dataset used in the empirical analysis contains 36,394 observations. Table 1 reports the definitions of the variables used in the econometric analysis with weighted summary statistics.

4.1 Measures of Environmental Attitude and Behavior

The 1998 wave of the MHS includes a section devoted to environmental issues. This section is used for identifying measures of pro-environmental attitudes and behavior. Among the main environmental problems, we consider waste prevention and disposal, as waste reduction is at the top of the waste hierarchy (Palmer et al 1997; Pearce 2004) and the European Commission has published several waste directives with the aims of reducing waste generation and increasing waste recycling (Nicolli and Mazzanti 2011; Cecere et al. 2014). We consider the individual's

concern regarding waste prevention and disposal as a measure of pro-environmental attitudes. The first dependent variable, *Waste Concern*, is a dummy variable equal to one if the respondent claims that “waste prevention and disposal” is “the most worrying environmental problem”. Individuals who express concern regarding waste prevention and disposal are not necessarily willing to incur a cost to protect the environment. To measure willingness to pay a cost to protect the environment, we use a different variable, i.e., pro-environmental behavior. The second dependent variable, *Recycling Behavior*, is a binary variable equal to one if the individual recycles at least one of four different materials: paper, glass, plastic and aluminium. *Recycling Behavior* is a behavioral action, as it demonstrates actual willingness to support a cost to protect the environment.³ As Table 1 shows, while less than half of the respondents in our sample express concern regarding waste prevention and disposal (*Waste Concern*), the proportion of respondents who recycle (*Recycling Behavior*) is greater, at 65%.

4.1.1 Measure of self image

We believe that to present a self image to society, individuals decide to cooperate for the sake of the common good. Thus, the key independent variable is *Self Image*, measured on a scale from 0 to 3, with 3 indicating the highest level of civic cooperation that limits free-riding behavior. A series of environmental questions in the 1998 wave of the MHS captures individual behaviors toward civic cooperation. We examine three behaviors, and we add 1 to *Self Image* each time the respondent states that he/she never engaged in the following behaviors: (a) “throw paper in the street”; (b) “double park”; and (c) “engage in noisy driving behaviors”. The sample average of the index of self image is 1.77, and the standard deviation is 0.85.

4.1.2 Demographic and socio-economic characteristics

To account for factors that might influence both waste attitudes and recycling behavior and self image, we control for numerous demographic and socio-economic characteristics. We account for gender (*Female*), with male as the reference category, and for marital status, by including categories for married, divorced and widowed against a base category of being single. We consider age (*Age31–40*, *Age41–50*, *Age51–60*, *Age61–70*, *Age71–80*, with *Age16–30* used as the reference group), the number of individuals living in the household (*HouseholdSize*), two variables representing the level of education attained (*LowEducation* and *Bachelor’s Degree*, with *High*

³Although recycling was mandatory in Italy 1998, in practice, it was voluntary with no monetary incentives or effective monetary sanctions.

Table 1. Weighted descriptive statistics			
Variable	Description	Mean	Standard deviation
<i>Dependent variables</i>			
Waste concern	=1 if waste protection and disposal is the most worrying environmental problem	0.41	0.49
Recycling behaviour	=1 if respondent recycles at least one of four different materials: paper, glass, plastic and aluminum	0.65	0.48
<i>Key independent variable</i>			
Self image	0-3 scale of civic behaviour	1.77	0.85
<i>Demographic and socio-economic characteristics</i>			
Female	= 1 if female. Reference group: male	0.50	0.50
Married	= 1 if married. Reference group: single	0.60	0.49
Divorced	= 1 if separated/divorced	0.03	0.17
Widowed	= 1 if widowed	0.05	0.22
Age31-40	= 1 if age between 31 and 40. Reference group: age 16-30	0.18	0.39
Age41-50	= 1 if age between 41 and 50	0.17	0.38
Age51-60	= 1 if age between 51 and 60	0.15	0.36
Age61-70	= 1 if age between 61 and 70	0.12	0.33
Age71-80	= 1 if age between 71 and 80	0.07	0.26
Household size	Number of people who live in family	3.37	1.25
Low education	= 1 if no education, completed elementary school and completed junior high school. Reference group: high school (diploma)	0.59	0.49
Bachelor's degree	= 1 if university degree and/or doctorate	0.08	0.27
Household income (ln)	Natural logarithm of household income	10.73	0.44
Good health	= 1 if self-perceived health is good	0.76	0.42
Unemployed	= 1 if unemployed. Reference group: other status	0.07	0.25
Entrepreneur	= 1 if entrepreneur	0.05	0.22
Employed	= 1 if employed	0.45	0.50
Retired	= 1 if retired	0.18	0.39
Homeowner	= 1 if homeowner	0.72	0.45
Newspapers	= 1 if newspapers every day	0.24	0.43
<i>Perception of community problems</i>			
Micro-criminality	= 1 if pickpocketed	0.03	0.18
No parking problems	= 1 if no difficulty parking	0.35	0.48
No traffic problems	= 1 if no traffic problems	0.20	0.40
No pollution	= 1 if no pollution	0.24	0.46
No dirtiness problems	= 1 if no filth	0.23	0.42
<i>Size of municipality</i>			
Metropolis	= 1 if metropolitan area. Reference group: <2,000 inhabitants	0.22	0.42
Neighbouring metropolis	= 1 if close to metropolitan area	0.08	0.27
>50,000	= 1 if more than 50,000 inhabitants	0.15	0.36
10,000-50,000	= 1 if between 10,000 and 50,000 inhabitants	0.22	0.41
2,000-10,000	= 1 if between 2,000 and 10,000 inhabitants	0.24	0.43
<i>Social participation</i>			
Union membership	= 1 if passive and/or active participation in trade unions	0.09	0.29
Volunteering membership	= 1 if passive and/or active participation in voluntary associations	0.11	0.31
Political membership	= 1 if passive and/or active participation in political party	0.04	0.21
Church attendance	= 1 if church attendance one or more a week	0.33	0.47
Environmental membership	= 1 if passive participation in environmental associations	0.02	0.13

Table 1

School being the reference category). We further control for the natural logarithm of household income (*Household Income (ln)*), self-reported good health (*GoodHealth*), employment status (*Unemployed*, *Entrepreneur*, *Employed*, *Retired* with other status employed as the reference category), tenure status (*Homeowner*) and the habit of reading newspapers (*Newspapers*). The average respondent in the sample is married, has low education (elementary school and/or junior high school completed), is in good health and a homeowner. We also control for the quality of the surrounding environment where the respondent lives. These variables are designed to measure the respondent's beliefs regarding potential environmental problems related to the area where he/she lives. These indicators of subjective perception are public safety where the household lives (*Micro – criminality*) and a number of other issues such as parking (*No Parking Problems*), traffic (*No Traffic Problems*), pollution (*No Pollution*) and dirtiness (*No Dirtiness Problem*). Moreover, we also control for the size of municipality (metropolis, neighboring metropolis, more than 50,000, 10,000-50,000, and 2,000-10,000, with fewer than 2,000 inhabitants being the reference category). Regional fixed effects are also included to account for the high regional heterogeneity in economic development and environmental quality existing in Italy.

4.1.3 Other pro-social behaviors: social participation

Civic-minded individuals are more likely to participate in the aims and activities of social movements than are free riders. Although self image clearly affects behaviors concerning civic cooperation, social participation may be related to civic cooperation and waste attitudes and recycling behavior. Hence, to isolate the effect of *Self Image* and ensure that its coefficient estimates are robust, we also construct social participation variables and include them in some of the models to study how these variables influence *Waste Concern* and *Recycling Behavior*. We construct three variables reflecting passive and active membership in associations. *Union Membership*, *Volunteering Membership* and *Political Membership* are dummy variable equal to one if the individual is a passive member (the individual participated in meetings of an association) and/or a active member (the individual did unpaid work for association), in trade unions, volunteering associations and political parties. On average, approximately 10% of the respondents participate in trade unions and voluntary associations, while the participation rate in political parties is only 4%. Moreover, we also include a *Church Attendance*, a binary variable that is equal to one if the respondent attends a church or another place of worship one or more times per week. Religious traditions include world views, ethical precepts and spiritual elements that shape perceptions of the natural environment and can act as guiding principles regarding how individual

acts and choices affect nature (Owen and Videras 2007). The sample mean of this variable is 0.33. Finally, individuals who participate in activities promoted by environmental organizations may be more likely to learn about the value of preserving the natural environment (Owen and Videras 2006). Hence, we also include the variable *Environmental Membership*, which equals one if the individual reports participation in environmental associations. The sample mean of this variable is only 0.02.

4.2 Empirical strategy

We empirically model the relationship among self image, waste attitudes and recycling behavior using the following sets of models. First, we estimate *Waste Concern* and *Recycling Behavior* as a function of demographic, socio-economic characteristics and regional dummies

$$Pr(Waste_i = 1) = \Psi(\alpha_0 + \alpha_1 SI_i + \alpha_2 D_i + \alpha_3 T_i) \quad (4.1)$$

$$Pr(Recycle_i = 1) = \Psi(\beta_0 + \beta_1 SI_i + \beta_2 D_i + \beta_3 T_i) \quad (4.2)$$

where waste and recycle reflect an individual's concern regarding waste prevention and disposal and the individual's choice to recycle least one of four different materials: paper, glass, plastic and aluminium. *SI* is our measure of self image; *D* is a matrix containing gender, marital status, age, education, household size and income, self-reported good health, employment status, tenure status, the habit of reading newspapers, the quality of the surrounding environment and the size of municipality where the respondent lives. *T* is the vector of regional dummies; $\Psi(\cdot)$ is the cumulative distribution function of a normal standard. Second, to assess the robustness of our measure of self image, we expand equations (4.1) and (4.2) to include individual social participation variables:

$$Pr(Waste_i = 1) = \Psi(\alpha_0 + \alpha_1 SI_i + \alpha_2 D_i + \alpha_3 T_i + \alpha_4 SP_i) \quad (4.3)$$

$$Pr(Recycle_i = 1) = \Psi(\beta_0 + \beta_1 SI_i + \beta_2 D_i + \beta_3 T_i + \beta_4 SP_i) \quad (4.4)$$

where *SP* is a matrix containing social participation variables, i.e., participation in trade unions, volunteering and environmental associations, political parties and churchgoing. Then, we apply the theoretical framework under the assumption that individuals react to environmental problems in different ways. Thus, we want to understand whether there is the same relationship among the decision variables for the category of anti-environmentalists, i.e., individuals who are not interested in environmental issues. Therefore, we estimate equations (4.3) and (4.4) on the sub-sample of non-environmentalists with the aim of identifying statistically significant marginal effects of self image even among the sub-sample of non-environmentalists.

5 Results

In this section, we report the econometric results. Section 5.1 presents the findings from the baseline models, while Section 5.2 reports results with robustness checks.

5.1 Baseline findings

Table 2 presents the probit estimations of equations (4.1) and (4.2). The first column shows marginal effects, and the second column presents the standard errors, which are corrected for heteroskedasticity. Before commenting on the results regarding the measure of self image, we note the findings regarding the demographic and socio-economic characteristics and regional dummies. The key demographic and socio-economic determinants of waste concern and recycling behavior are the age71-80 dummy, education and household income. The marginal effect for the age cohort between 71 and 80 years of age exhibits a negative sign and is statistically significant at the 1% level. Hence, being an older person decreases the probability of exhibiting waste attitudes and recycling behavior by approximately 6% and 9%, respectively. Low education enters the waste and recycling equations with a negative and statistically significant (1%) marginal effect. This means that an individual who has completed elementary school and/or junior high school has lower waste attitudes and recycling behavior than an individual with a high school diploma. Moreover, university graduates also have a higher probability of exhibiting waste attitudes and recycling behavior than do high school leavers (significant at the 1% level). Thus, the results suggest that individuals with more education are more likely to state their support for environmental quality than are individuals with low levels of education. Household income has a significant and positive effect on *Waste Concern* and *Recycling Behavior* (significant at the 1% level). Individuals with high income are more likely to state their concern regarding waste prevention and disposal and are also more likely to recycle. Finally, perceptions of community problems also matter. An individual who states that there are no traffic problems in the area where he/she lives has a lower probability both of being concerned about waste prevention and disposal and engaging in recycling behavior (significant at the 5% and 1% levels, respectively). A number of other demographic and socio-economic characteristics have differential effects on waste attitudes and recycling behavior. Being married decreases the probability of declaring a pro-environmental attitude, while being married increases the likelihood of reporting a concern for waste prevention and disposal. The likelihood of having a pro-environmental attitude does not seem to depend on household size, perceived health, tenure status, the habit of reading newspapers or employment status. However, if an individual perceives the area where he/she lives as not being polluted, this belief encourages his/her concern regarding waste prevention

and disposal. Moreover, individuals living in area close to a metropolis have a higher likelihood of being concerned about waste.³

Regarding recycling behavior, being female increases the probability of recycling, while being divorced decreases recycling behavior. Household size is statistically significant at the 5% level and takes a negative sign, indicating that larger families are less likely to recycle. Employment status is also important. Unemployed and employed individuals recycle less, while the retired recycle more (all significant at the 1% level). Moreover, an individual who reads newspapers every day is also more likely to recycle (significant at the 1% level). Furthermore, an individual who reports that there are no parking problems or dirtiness in the area where he/she lives has a higher likelihood of recycling (significant at conventional levels). Finally, living in a city close to a metropolis reduces the probability of recycling. The covariates also include 18 regional dummies (*Valle d'Aosta* is aggregated with *Piemonte*), with *Lombardia* as the reference region, for which the marginal effects are not shown for reasons of space. Individuals living in southern Italy are less likely to report pro-environmental attitudes and behavior. In particular, individuals in *Sicilia* have the lowest probability of reporting being concerned about waste prevention and disposal, while individuals in *Campania* have the lowest probability of recycling. As we control for a full set of individual-level demographic, social and economic variables, a plausible explanation for such findings should be sought in regional economic and institutional factors, comprising economic growth and environmental policy. The probit estimations of equations (4.1) and (4.2) with demographic, socio-economic characteristics and regional dummies (Table 2) show evidence for the expected positive relationships among self image, waste attitudes and recycling behavior. The marginal effects of *Self Image* in the equations estimating *Waste Concern* and *Recycling Behavior* are positive and statistically significant at the 1% level. The marginal effect of *Self Image* in explaining *Waste Concern* is 1.4%. In the recycling equation, the marginal effect is twice as large, at 2.9%.

³Notes for Table 2: The dependent variables waste and recycle take value 1 if a) an individual claims that waste prevention and disposal is the most worrying environmental problem and b) an individual recycles at least one of four different materials: paper, glass, plastic and aluminum, respectively. The model is estimated with a standard probit. Regressors' legend: see Table 1. Regional dummies are omitted for reasons of space. The standard errors are corrected for heteroskedasticity. The symbols ***, **, * denote that the coefficient is statistically different from zero at 1, 5 and 10%, respectively.

Table 2. Probit results: marginal effects of waste and recycle				
Variable	Waste		Recycle	
	dF/dx	Std. Err.	dF/dx	Std. Err.
Civic norm	0.014***	0.003	0.029***	0.003
Female	-0.012**	0.006	0.012***	0.006
Married	0.020**	0.008	-0.009	0.009
Divorced	0.011	0.016	-0.053***	0.017
Widowed	-0.001	0.015	-0.004	0.010
Age31-40	0.002	0.010	0.002	0.011
Age41-50	-0.012	0.010	0.014	0.024
Age51-60	-0.018	0.011	0.023*	0.012
Age61-70	-0.019	0.013	-0.010	0.014
Age71-80	-0.062***	0.015	-0.087***	0.018
Household size	-0.002	0.003	-0.008**	0.003
Low education	-0.029***	0.007	-0.039***	0.007
Bachelor's degree	0.034***	0.010	0.031***	0.011
Household income (ln)	0.063***	0.010	0.100***	0.010
Good health	0.008	0.006	0.009	0.007
Unemployed	-0.020*	0.011	-0.063***	0.012
Entrepreneur	0.018	0.012	-0.015	0.013
Employed	-0.007	0.007	-0.032***	0.008
Retired	0.011	0.010	0.036***	0.010
Homeowner	0.004	0.007	-0.000	0.007
Newspapers	-0.010	0.006	0.023***	0.007
Micro-criminality	-0.022	0.014	0.030*	0.015
No parking problems	0.012*	0.007	0.031***	0.007
No traffic problems	-0.019**	0.008	-0.024***	0.009
No pollution	0.033***	0.008	0.001	0.008
No dirtiness problems	-0.014*	0.007	0.020**	0.008
Metropolis	0.018	0.011	-0.015	0.012
Neighbouring metropolis	0.029**	0.013	-0.028**	0.014
>50,000	0.016	0.012	-0.022*	0.012
10,000-50,000	0.017	0.011	-0.010	0.012
2,000-10,000	0.011	0.011	-0.019	0.012
Regional dummies	Yes		Yes	
No. of observations	35426		35212	
Pseudo R-squared	0.0158		0.1912	
Log-likelihood	-23231.29		-19019.69	

Table 2

5.2 Robustness check

The observed association among self image, waste attitudes and recycling could conceal the effect of other factors that lead to individuals having a high willingness both to cooperate in the provision of public goods and to protect environmental quality. Thus, the first potential problem with the interpretation of our results is omitted variable bias. We address this problem by adding social participation variables. As described in Section 4.1.4, we consider variables intended to capture additional social/relational aspects of individual behavior such as membership in various types of associations and churchgoing. Tables 3 and 4 present the results for the waste and recycling equations (4.3) and (4.4). Standard errors corrected for heteroskedasticity are presented in brackets. In the waste equations, we find that the marginal effect on *Self Image* remains unchanged when including the social participation variables (Table 3, Columns I through VI). We find evidence that union and volunteering membership are positive and significant predictors of reporting concern about waste prevention and disposal (both at the 1% level) (Columns I and II), the marginal effects of which are robust to simultaneously including all social participation variables (Column VI). Being a member (passive and/or active) of a trade union or a volunteering association is positively correlated with the likelihood of reporting waste concern, increasing the likelihood by 3.4% and 6.5%, respectively. When considered individually, political and environmental membership and church attendance are statistically significant at conventional levels or greater (Columns III through V), but when considered simultaneously, their statistical significance disappears (Column VI), showing that they are not robust predictors of an individual's concern regarding waste prevention and disposal. In particular, the result on participation in environmental groups suggests that environmental membership is not an indication of greater environmental concern. It is important to emphasize that the marginal effects on the other covariates remain stable (with respect to the results reported in Table 2), with the exception of the habit of reading a newspaper every day. Adding control variables for social participation implies that newspaper readership is statistically significant at 5% with a negative sign (Table 3, Column VI). This evidence indicates that the habit of reading a newspaper every day decreases the probability of reporting *Waste Concern*.⁴

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In the recycling equations, we also find that the marginal effect on *Self Image* remains stable when including social participation variables (Table 4, Columns I through VI). We also

⁴Notes for Table 3: see Table 2

⁵Notes for Table 4: see Table 2

Variable	I	II	III	IV	V	VI
Civic norm	0.014(0.003)***	0.013(0.003)***	0.014(0.003)***	0.014(0.003)***	0.014(0.003)***	0.013(0.003)***
Union membership	0.044(0.009)***					0.034(0.010)***
Volunteering membership		0.070(0.009)***				0.065(0.009)***
Political membership			0.036(0.013)***			0.012(0.014)
Church attendance				0.013(0.06)**		0.007(0.006)
Environmental member.					0.041(0.020)**	-0.001(0.021)
Female	-0.010(0.006)*	-0.011(0.006)*	-0.010(0.006)*	-0.014(0.006)**	-0.011(0.006)*	-0.010(0.006)*
Married	0.019(0.008)**	0.021(0.008)**	0.020(0.008)**	0.019(0.008)**	0.020(0.008)**	0.020(0.008)**
Divorced	0.010(0.016)	0.012(0.016)	0.011(0.016)	0.011(0.016)	0.011(0.016)	0.011(0.016)
Widowed	-0.002(0.015)	0.000(0.015)	-0.001(0.015)	-0.002(0.015)	-0.000(0.015)	-0.001(0.015)
Age31-40	0.001(0.010)	0.002(0.010)	0.002(0.010)	0.001(0.010)	0.002(0.010)	0.001(0.010)
Age41-50	-0.015(0.010)	-0.013(0.010)	-0.012(0.010)	-0.013(0.010)	-0.012(0.010)	-0.016(0.010)
Age51-60	-0.019(0.011)*	-0.017(0.011)	-0.018(0.011)	-0.020(0.011)	-0.017(0.011)	-0.020(0.011)*
Age61-70	-0.019(0.013)	-0.017(0.013)	-0.019(0.013)	-0.023(0.013)*	-0.018(0.013)	-0.019(0.013)
Age71-80	-0.062(0.015)***	-0.056(0.015)***	-0.062(0.015)***	-0.065(0.015)***	-0.061(0.015)***	-0.060(0.015)***
Household size	-0.002(0.003)	-0.001(0.003)	-0.002(0.003)	-0.002(0.003)	-0.001(0.003)	-0.002(0.003)
Low education	-0.028(0.007)***	-0.026(0.007)***	-0.028(0.007)***	-0.029(0.007)***	-0.029(0.007)***	-0.025(0.007)***
Bachelor's degree	0.033(0.010)***	0.032(0.010)***	0.034(0.010)***	0.033(0.010)***	0.035(0.010)***	0.033(0.011)***
Household income (ln)	0.063(0.010)***	0.061(0.010)***	0.063(0.010)***	0.063(0.010)***	0.063(0.010)***	0.061(0.010)***
Good health	0.008(0.006)	0.009(0.006)	0.008(0.006)	0.008(0.006)	0.008(0.007)	0.008(0.006)
Unemployed	-0.020(0.011)*	-0.017(0.011)	-0.019(0.011)*	-0.018(0.011)*	-0.019(0.011)*	-0.017(0.011)
Entrepreneur	0.026(0.012)**	0.020(0.012)	0.017(0.012)	0.018(0.012)	0.019(0.012)	0.023(0.012)*
Employed	-0.012(0.007)*	-0.005(0.007)	-0.007(0.007)	-0.005(0.007)	-0.006(0.007)	-0.008(0.007)
Retired	0.011(0.010)	0.010(0.010)	0.012(0.010)	0.012(0.010)	0.012(0.010)	0.011(0.010)
Homeowner	0.004(0.007)	0.004(0.007)	0.004(0.007)	0.003(0.007)	0.003(0.007)	0.003(0.007)
Newspapers	-0.011(0.006)*	-0.012(0.006)*	-0.012(0.006)*	-0.010(0.006)*	-0.011(0.006)*	-0.013(0.006)**
Micro-criminality	-0.023(0.014)	-0.023(0.014)	-0.022(0.014)	-0.022(0.014)	-0.022(0.015)	-0.023(0.015)
No parking problems	0.011(0.007)	0.011(0.007)*	0.011(0.007)*	0.012(0.007)*	0.012(0.007)*	0.010(0.007)
No traffic problems	-0.018(0.008)**	-0.019(0.008)**	-0.019(0.008)**	-0.018(0.008)**	-0.019(0.008)**	-0.019(0.008)**
No pollution	0.033(0.008)***	0.033(0.008)***	0.033(0.008)***	0.032(0.008)***	0.034(0.008)***	0.033(0.008)***
No dirtiness problems	-0.013(0.007)*	-0.013(0.007)*	-0.013(0.007)*	-0.014(0.007)*	-0.014(0.007)*	-0.013(0.007)*
Metropolis	0.018(0.011)	0.019(0.011)*	0.018(0.011)	0.018(0.011)	0.016(0.011)	0.017(0.011)
Neighbouring metropolis	0.029(0.013)**	0.030(0.013)**	0.030(0.013)**	0.029(0.013)**	0.029(0.013)**	0.030(0.013)**
>50,000	0.015(0.012)	0.016(0.012)	0.015(0.012)	0.016(0.012)	0.015(0.012)	0.016(0.012)
10,000-50,000	0.017(0.011)	0.018(0.011)	0.017(0.011)	0.018(0.011)	0.016(0.011)	0.016(0.011)
2,000-10,000	0.010(0.011)	0.011(0.011)	0.010(0.011)	0.011(0.011)	0.010(0.011)	0.011(0.011)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	35248	35246	35277	35387	35005	34969
Pseudo R-squared	0.0164	0.0173	0.0161	0.0159	0.0161	0.0176
Log-likelihood	-23098.05	-23076.86	-23123.37	-23201.22	-22940.28	-22878.71

Table 3

Table 4. Probit results: marginal effects of robustness analysis of recycling						
Variable	I	II	III	IV	V	VI
Civic norm	0.030(0.003)***	0.029(0.003)***	0.029(0.005)***	0.029(0.005)***	0.030(0.003)***	0.029(0.003)***
Union membership	0.054(0.010)***					0.048(0.010)***
Volunteering membership		0.093(0.009)***				0.080(0.009)***
Political membership			0.029(0.014)**			-0.008(0.015)
Church attendance				0.042(0.006)***		0.036(0.006)***
Environmental member.					0.128(0.019)***	0.087(0.022)***
Female	0.014(0.006)**	0.013(0.006)**	0.013(0.006)**	0.005(0.006)	0.013(0.006)**	0.009(0.006)
Married	-0.010(0.009)	-0.008(0.009)	-0.009(0.009)	-0.009(0.009)	-0.008(0.009)	-0.008(0.009)
Divorced	-0.052(0.017)***	-0.050(0.017)***	-0.052(0.017)***	-0.049(0.017)***	-0.053(0.017)***	-0.048(0.017)***
Widowed	-0.018(0.016)	-0.016(0.016)	-0.017(0.016)	-0.015(0.016)	-0.016(0.016)	-0.017(0.016)
Age31-40	-0.005(0.010)	-0.003(0.010)	-0.004(0.010)	-0.006(0.010)	-0.004(0.010)	-0.006(0.010)
Age41-50	0.000(0.011)	0.003(0.011)	0.002(0.011)	-0.001(0.011)	0.004(0.011)	0.003(0.011)
Age51-60	0.021(0.012)*	0.022(0.012)*	0.022(0.012)*	0.017(0.012)	0.025(0.012)**	0.018(0.012)
Age61-70	-0.011(0.014)	-0.008(0.014)	-0.011(0.014)	-0.019(0.014)	-0.008(0.014)	-0.014(0.014)
Age71-80	-0.087(0.018)***	-0.080(0.018)***	-0.087(0.018)***	-0.098(0.018)***	-0.083(0.018)***	-0.088(0.018)***
Household size	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.007(0.003)**	-0.006(0.003)**
Low education	-0.037(0.007)***	-0.034(0.007)***	-0.038(0.007)***	-0.039(0.007)***	-0.037(0.007)***	-0.032(0.007)***
Bachelor's degree	0.031(0.011)***	0.030(0.011)***	0.032(0.011)***	0.031(0.011)***	0.031(0.011)***	0.029(0.011)***
Household income (ln)	0.098(0.011)***	0.095(0.011)***	0.098(0.011)***	0.097(0.011)***	0.097(0.011)***	0.093(0.011)***
Good health	0.009(0.007)	0.010(0.007)	0.009(0.007)	0.010(0.007)	0.010(0.007)	0.011(0.007)
Unemployed	-0.064(0.012)***	-0.063(0.012)***	-0.064(0.012)***	-0.059(0.012)***	-0.062(0.012)***	-0.058(0.012)***
Entrepreneur	-0.006(0.013)	-0.014(0.014)	-0.015(0.014)	-0.014(0.013)	-0.012(0.014)	-0.004(0.014)
Employed	-0.039(0.008)***	-0.030(0.008)***	-0.032(0.008)***	-0.028(0.008)***	-0.031(0.008)***	-0.032(0.008)***
Retired	0.036(0.010)***	0.035(0.010)***	0.036(0.010)***	0.037(0.010)***	0.036(0.010)***	0.035(0.010)***
Homeowner	0.001(0.007)	0.001(0.007)	0.000(0.007)	-0.001(0.007)	0.001(0.007)	0.000(0.007)
Newspapers	0.022(0.007)***	0.022(0.007)***	0.022(0.007)***	0.023(0.007)***	0.024(0.007)***	0.021(0.007)***
Micro-criminality	0.028(0.016)*	0.027(0.016)*	0.029(0.016)*	0.030(0.016)*	0.029(0.016)*	0.028(0.016)*
No parking problems	0.031(0.007)***	0.030(0.007)***	0.031(0.007)***	0.031(0.007)***	0.032(0.007)***	0.030(0.007)***
No traffic problems	-0.023(0.009)**	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***	-0.024(0.009)***
No pollution	0.002(0.008)	0.002(0.008)	0.002(0.008)	0.000(0.008)	0.003(0.008)	0.002(0.008)
No dirtiness problems	0.020(0.008)**	0.020(0.007)**	0.019(0.008)**	0.019(0.008)**	0.018(0.008)**	0.018(0.008)**
Metropolis	-0.015(0.012)	-0.015(0.012)	-0.015(0.012)	-0.015(0.012)	-0.016(0.012)	-0.016(0.012)
Neighbouring metropolis	-0.030(0.014)**	-0.029(0.014)**	-0.029(0.014)**	-0.028(0.014)**	-0.031(0.014)**	-0.031(0.014)**
>50,000	-0.023(0.012)*	-0.022(0.012)*	-0.022(0.012)*	-0.021(0.012)*	-0.023(0.012)*	-0.022(0.012)*
10,000-50,000	-0.011(0.012)	-0.011(0.012)	-0.010(0.012)	-0.010(0.012)	-0.011(0.012)	-0.011(0.012)
2,000-10,000	-0.019(0.012)	-0.018(0.012)	-0.018(0.012)	-0.018(0.012)	-0.020(0.012)*	-0.019(0.012)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	35036	35033	35064	35173	34796	34760
Pseudo R-squared	0.1918	0.1934	0.1913	0.1925	0.1922	0.1954
Log-likelihood	-18909.23	-18869.92	-18937.14	-18969.35	-18772.16	-18680.58

Table 4

find evidence that union and volunteering membership are positive and significant predictors of recycling (both at the 1% level) (Columns I and II), the marginal effects of which are robust to simultaneously considering all social participation variables (Column VI). Being a member of a trade union or a volunteering association is positively linked to the likelihood of recycling behavior, increasing the likelihood by 4.8% and 8.0%, respectively. Moreover, when considered both individually and simultaneously with all other control variables, church attendance and environmental membership are robust predictors of recycling behavior (Column VI). Attending church one or more times per week and being a passive member of an environmental association is positively related to the probability of recycling, increasing the likelihood by 3.6% and 8.7%, respectively. This last result indicates that participation in environmental groups is an indication of higher pro-environmental behavior. It is also important to emphasize that the marginal effects on the other covariates remain stable (with respect to the results reported in Table 2) with the exception of being female. Adding church attendance implies that the marginal effect of being female on recycling behavior is no longer statistically significant (Table 4, Columns IV and VI). This finding indicates that the effect of being female on recycling behavior is mediated by churchgoing. Overall, the results in Table 3 and Table 4 show that being civic-minded has a robust and positive statistically significant relationship with the likelihood of reporting waste concern and recycling behavior even after controlling for additional social relations aspects of individual behaviors that might correlate with the level of civic cooperation.

An anti-environmentalist may contribute to addressing environmental problems due an individual's willingness to cooperate in the provision of a public good. Hence, if we find statistically significant coefficients of *Self Image* even among the sub-sample of anti-environmentalists, the results should support the conclusions of the theoretical framework, which contends that there is a positive relationship among the decision variables even among the anti-environmentalists. Therefore, we estimate equations (4.1) and (4.2) on the sub-sample of 21,454 anti-environmentalists, i.e., individuals who are not interested in environmental issues.⁶

Weighted summary statistics are reported in Appendix A, Table 1A. The results are shown in Table 5. We find that civic cooperation remains important for environmental concern and behavior. The marginal effects of *Self Image* in the equations estimating waste and recycling are still positive and statistically significant. The marginal effect of *Self Image* in explaining *Waste Concern* decreases to 0.7% and remains significant at the 10% level. In the recycling equation, the marginal effect decreases to 2.2% but remains significant at the 1% level. Moreover, for individuals who are not interested in environmental issues, the key demographic and socio-

⁶Notes for Table 5: see Table 2

Table 5. Probit results: marginal effects of the sample who takes little or no care about environmental issues				
Variable	Waste		Recycle	
	dF/dx	Std. Err.	dF/dx	Std. Err.
Civic norm	0.007*	0.004	0.022***	0.005
Union membership	0.034**	0.014	0.059***	0.016
Volunteering membership	0.053***	0.014	0.063***	0.016
Political membership	0.006	0.021	-0.006	0.024
Church attendance	0.016**	0.008	0.051***	0.008
Environmental member.	-0.021	0.037	0.113**	0.043
Female	-0.006	0.008	0.015*	0.009
Married	0.028***	0.011	-0.002	0.012
Divorced	0.026	0.021	-0.049**	0.023
Widowed	0.001	0.018	0.010	0.020
Age31-40	-0.027**	0.012	-0.012	0.014
Age41-50	-0.026**	0.013	-0.011	0.015
Age51-60	-0.039***	0.014	0.019	0.016
Age61-70	-0.038**	0.016	-0.023	0.019
Age71-80	-0.072***	0.018	-0.080***	0.022
Household size	0.000	0.003	-0.000	0.004
Low education	-0.003	0.009	-0.023**	0.010
Bachelor's degree	0.028*	0.017	0.030	0.019
Household income (ln)	0.054***	0.013	0.078***	0.015
Good health	0.008	0.008	0.010	0.009
Unemployed	-0.007	0.014	-0.041***	0.015
Entrepreneur	0.021	0.017	-0.001	0.019
Employed	0.014	0.010	-0.019*	0.011
Retired	0.035***	0.013	0.044	0.014
Homeowner	0.002	0.009	0.016	0.010
Newspapers	-0.018**	0.009	0.043***	0.010
Micro-criminality	-0.028	0.019	0.039*	0.022
No parking problems	0.007	0.009	0.040***	0.010
No traffic problems	-0.022**	0.011	-0.044***	0.012
No pollution	0.036***	0.010	0.014	0.011
No dirtiness problems	-0.002	0.009	0.023**	0.011
Metropolis	0.024*	0.014	-0.011	0.016
Neighbouring metropolis	0.043**	0.017	-0.037*	0.019
>50,000	0.014	0.015	-0.026	0.016
10,000-50,000	0.020	0.014	-0.015	0.016
2,000-10,000	0.015	0.014	-0.015	0.016
Regional dummies	Yes		Yes	
No. of observations	20666		20540	
Pseudo R-squared	0.0159		0.19051	
Log-likelihood	-13181.65		-11427.29	

Table5

economic determinants of *Waste Concern* and *Recycling Behavior* are the age71-80 dummy, education and household income.

6 Conclusions

To extend to the previous literature on the environmental habits of agents in protecting the environment, this paper attempts to create an original and plausible connection among the concept of identity and the role of self image and environmental attitudes and behavior. We do so to establish a credible and empirical link between the existence of non-monetary motivations and environmental protection, especially in cases such as recycling activity. The existence of different categories of agents characterized by multiple identities is a verifiable the real world. Thus, this is a unique attribute of our analysis that offers us the possibility to reveal other results to describe the phenomena at hand and offer policy implications. Beginning from this new premise, we consider a conceptual framework that is able to modify the analysis developed in the prior literature by identifying two categories of agents with different levels of optimal ideal and moral effort and studying their behavior separately. In so doing, we are able to distinguish the agents in a way that accounts for the heterogeneity of their identities. In addition, we consider two different utility functions, one for each category of agents, to explain their specific results in the maximization processes as direct consequences of the non-monetary incentives. Only by adopting this perspective can we perceive the relevance of the relationship between self image and environmental attitudes and behavior. In the empirical analysis, our conceptual and analytical framework is applied to a representative sample of Italian individuals who express attitudes and behaviors regarding two main environmental issues: waste prevention and disposal and recycling activities. For both categories of agents, the empirical findings, robust to the inclusion of additional pro-social behaviors, show that self image is related to an individual's concern regarding waste prevention and disposal and to an individual's recycling behavior. This confirms the positive relationship among self identity, pro-environmental attitudes and behavior; all of these elements move in the same direction, supporting the idea that they correspond to specific actions by agents with a well defined identity that can be pro- or anti-environmental. Finally, the uniqueness of the dataset helps us to emphasize an important policy implication; the 1998 wave of the Multipurpose Household Survey (MHS), conducted annually by the Italian Central Statistical Office, was administered during a period in which there were no public awareness campaigns to encourage the people to improve their recycling activity. Therefore, all of the actions of the agents are determined entirely by their own civic characteristics. In particular, this suggests that it is more important to allocate resources to improve the civic characteristics

of agents than to develop periodic awareness and information campaigns or to devote funds to improve monitoring and sanctioning actions to mandate respect for the environment.

References

- [1] Abbott A., Nandeibam S., O'Shea L., (2013), Recycling: social norms and warm-glow revisited, *Ecological Economics*, 90, 10-18.
- [2] Agovino M., Garofalo A., Mariani A., (2016), Effects of environmental regulation on separate waste collection dynamics: empirical evidence from Italy, *Journal of Cleaner Production*, DOI: 10.1016/j.jclepro.2016.02.082.
- [3] Akerlof G. A., Kranton R. E., (2000), Economics and identity, *The Quarterly Journal of Economics*, CXV, 715-753.
- [4] Akerlof G.A., Kranton R. E., (2005), Identity and the economics of organizations, *Journal of Economic Perspectives*, 19, 9-32.
- [5] Ipizar F., Gsottbauer E., (2015), Reputation and household recycling practices: field experiments in Costa Rica, *Ecological Economics*, 120, 366-375.
- [6] Andreoni J., (1990), Impure altruism and donations to public goods: a theory of warm-glow giving, *Economic Journal*, 100, 464-477.
- [7] Barr S., (2007), Factors influencing environmental attitudes and behaviors: A U.K. Case study of household waste management, *Environment and Behavior*, 39, 435-473.
- [8] Berglund C., (2006), The assessment of households' recycling costs: the role of personal motives, *Ecological Economics*, 56, 560-569.
- [9] Biel A., Thøgersen J., (2007), Activation of social norms in social dilemmas: a review of the evidence and reflections on the implications for environmental behaviour, *Journal of Economic Psychology*, 28, 93-112.
- [10] Brekke K. A., Kverndokk S., Nyborg K., (2003), An economic model of moral motivation, *Journal of Public Economics*, 87, 1967-1983.
- [11] Brekke K. A., Kipperberg G., Nyborg K., (2010), Social interaction in responsibility ascription; the case of household recycling, *Land Economics*, 86, 766-784.
- [12] Bruvoll A., Halvorsen B., Nyborg K., (2002), Households' recycling efforts, *Resources, Conservation and Recycling*, 36, 337-354.
- [13] Cecere G., Mancinelli S., Mazzanti M., (2014), Waste prevention and social preferences: the role of intrinsic and extrinsic motivations, *Ecological Economics*, 107, 163-176.

- [14] Chu P.Y., Chiu J.F., (2003), Factors influencing household waste recycling behavior: test of an integrated model, *Journal of Applied Social Psychology*, 33, 604-628.
- [15] Collins A., O'Doherty R., Snell M. C., (2006), Household participation in waste recycling: some national survey evidence from Scotland, *Journal of Environmental Planning and Management*, 49, 121-140.
- [16] Crociata A., Agovino M., Sacco P.L., (2015), Recycling waste: does culture matter?, *Journal of Behavioral and Experimental Economics*, 55, 40-47.
- [17] Czajkowski M., Kadziela T., Hanley N., (2014), We want to sort! Assessing households' preferences for sorting waste, *Resource and Energy Economics*, 36, 290-306.
- [18] Czajkowski M., Hanley N., Nyborg K., (2015), Social norms, morals and self-interest as determinants of pro-environmental behaviours: the case of household recycling, *Environmental and Resource Economics*, DOI: 10.1007/s10640-015-9964-3.
- [19] Daube M., Ulph D., (2016), Moral behaviour, altruism and environmental policy, *Environmental and Resource Economics*, 63, 505-522.
- [20] Deci E. L., (1971), Effects on externally mediated rewards on intrinsic motivation, *Journal of Personality and Social Psychology*, 18, 105-115.
- [21] Ebreo A., Vining J., (2000), Motives as predictors of the public's attitudes towards solid waste issues, *Environmental Management*, 25, 153-168.
- [22] Fiorillo D., (2013), Household waste recycling: national survey evidence from Italy, *Journal of Environmental Planning and Management*, 56, 1125-1151.
- [23] Halvorsen B., (2008), Effects of norms and opportunity cost of time on household recycling, *Land economics*, 84, 501-516.
- [24] Hage O., Soderholm P., Berglund C., (2009), Norms and economic motivation in household recycling: empirical evidence for Sweden, *Resources, Conservation and Recycling*, 53, 155-165.
- [25] Hopper J.R., McCarl Nielsen J., (1991), Recycling as altruistic behavior. Normative and behavioral strategies to expand participation in a community recycling program, *Environment and Behavior*, 23, 195-220.

- [26] Hornik J., Cherian J., Madansky M., Narayana C., (1995), Determinants of recycling behavior: a synthesis of research results, *Journal of Socio-Economics*, 24, 105-127.
- [27] Kinnaman T. C., (2006), Policy watch: examining the justification for residential recycling, *Journal of Economic Perspectives*, 20, 219-232. Istituto Nazionale di Statistica (ISTAT), Indagine MULTISCOPO sulle famiglie, aspetti della vita quotidiana, year 1998, Rome.
- [28] Meier S., (2006), A survey of economic theories and field evidence of pro-social behavior, Federal Reserve Bank of Boston Working Paper No. 06-6.
- [29] Nicolli F., Mazzanti M., (2011), Diverting waste: the role of innovation. In: OECD (Eds), *Invention and Transfer of Environmental Technologies*, OECD, Paris.
- [30] Nyborg K., Howarth R.B., Brekke K.A., (2006), Green consumers and public policy: on socially contingent moral motivation, *Resource and Energy Economics*, 28, 351-366.
- [31] Owen A. L., Videras J. R., (2006), Civic cooperation, pro-environmental attitudes, and behavioural intentions, *Ecological Economics*, 58, 814-829.
- [32] Owen A. L., Videras J. R., (2007), Culture and public goods: the case of religion and the voluntary provision of environmental quality, *Journal of Environmental Economics and Management*, 54, 162-180.
- [33] Palmer K., Sigman H., Walls M., (1997), The costs of reducing municipal solid waste, *Journal of Environmental Economics and Management*, 33, 128-150.
- [34] Pearce D.W., (2004), Does European Union waste policy pass a cost-benefit test?, *World Economics*, 15, 115-137.
- [35] Pretty J., (2003), Social capital and the collective management of resources, *Science*, 302, 1912-1914.
- [36] Pretty J., Ward H., (2001), Social capital and the environment, *World Development*, 29, 209-227.
- [37] Schultz P.W., Oskamp S., Mainieri T., (1995), Who recycles and when? A review of personal and situational factors, *Journal of Environmental Psychology*, 15, 105-121.
- [38] Sidique S.F., Lupi F., Joshi S.V., (2010). The effects of behavior and attitudes on drop-off recycling activities, *Resources, Conservation and Recycling*, 54, 242-249.

- [39] Thøgersen J.,(1996), Recycling and morality. A critical review of the literature, *Environment and Behavior*, 26, 536-558.
- [40] Thomas C., Sharp V., (2013), Understanding the normalisation of recycling behaviour and its implications for other pro-environmental behaviours: A review of social norms and recycling, *Resources, Conservation and Recycling*, 79, 11-20.
- [41] Torgler B., García-Valiñas M. A., (2007), The determinants of individuals' attitudes towards preventing environmental damage, *Ecological Economics*, 63, 536-552.
- [42] Tsai T., (2008), The impact of social capital on regional waste recycling, *Sustainable Development*, 16, 44-55.
- [43] Van den Bergh J.C.J.M., (2008), Environmental regulation of households: an empirical review of economic and psychological factors, *Ecological Economics*, 66, 559-574.
- [44] Videras J., Owen A. L., Conover E., Wu S., (2012), The influence of social relationships on pro-environment behaviors, *Journal of Environmental Economics and Management*, 63, 35-50.
- [45] Vining J., Ebreo A., (1990), What makes a recycler? A comparison of recyclers and nonrecyclers, *Environment and Behavior*, 22, 55-73.

Table 1A. Sub sample of non-environmentalists: weighted descriptive statistics		
Variable	Mean	Std. Dev.
<i>Dependent variables</i>		
Waste	0.37	0.48
Recycle	0.60	0.49
<i>Key independent variable</i>		
Civic norms	1.70	0.85
<i>Demographic and socio-economic characteristics</i>		
Female	0.50	0.50
Married	0.59	0.49
Divorced	0.03	0.17
Widowed	0.03	0.17
Age31-40	0.17	0.38
Age41-50	0.16	0.38
Age51-60	0.16	0.36
Age61-70	0.13	0.34
Age71-80	0.09	0.29
Household size	3.39	1.30
Low education	0.67	0.47
Bachelor's degree	0.04	0.21
Household income (ln)	10.66	0.45
Good health	0.74	0.43
Unemployed	0.07	0.26
Entrepreneur	0.05	0.22
Employed	0.42	0.49
Retired	0.20	0.40
Homeowner	0.70	0.46
Newspapers	0.20	0.40
<i>Perception of community problems</i>		
Micro-criminality	0.03	0.17
No parking problems	0.35	0.48
No traffic problems	0.21	0.41
No pollution	0.26	0.44
No dirtiness problems	0.23	0.42
<i>Size of municipality</i>		
Metropolis	0.23	0.42
Neighbouring metropolis	0.08	0.27
>50,000	0.15	0.36
10,000-50,000	0.22	0.41
2,000-10,000	0.25	0.43
<i>Social participation</i>		
Union membership	0.07	0.26
Volunteering membership	0.08	0.27
Political membership	0.03	0.18
Church attendance	0.34	0.47
Environmental membership	0.01	0.09